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ABSTRACT

A repeated measures design was used to assess the effects of a methadone maintenance program in several California locations. Subjects were 720 Chicano and Anglo men and women participating in rehabilitation programs for heroin addicts. The subjects were interviewed between 1978-1981, and the average follow-up time after initial treatment was 4-6 years. The follow-up rate was 90 percent of those alive at the time of the interview. This repeated measures design compared individuals' behaviors for a relatively long pretreatment period, in order to ensure a more stable baseline; for all periods during the treatment; and for all periods when not in treatment after the entry into initial treatment. The amount of time spent in treatment was also examined. The interview, adapted from Nurco's schedule, assessed behavior, legal problems, drug use, employment, etc., during the different time intervals. Results indicated that the time factor was significant for all outcome measures. Significant behavioral improvement was noted during times of treatment. Racial differences and sex differences were also noted. (GDC)

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ED280892

A Repeated Measures Design for Treatment Evaluation

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Introduction

This study evaluates the use of a repeated measures design for assessing the effects of social program intervention. Generally, conventional evaluation studies tend to use pre- and during treatment comparisons. However, this approach is subject to the following methodological biases: (1) the observed changes in behavior may be age-related, which may have occurred without treatment; (2) the use of a short pre-treatment period as the baseline level may result in spuriously inflated measures; that is, the measures reflect atypically excessive behaviors which bring the individuals into treatment in the first place; and (3) reliance on a single or a few measures.

A further complication in studies of treatment evaluation is that a subject's treatment history may not be a single episode but rather is often characterized by several intermittent or sequential episodes. To reduce the idiosyncratic effects of particular developmental stages of an individual's treatment history and to examine the accumulative treatment effects, the present study utilizes a repeated measures design to compare behaviors of an individual for: (1) a relatively long pre-treatment period to ensure a more stable baseline; (2) all periods while in treatment; and (3) all periods when not in treatment after the initial treatment entry. These last two periods are aggregated from respective intervals over the entire history of the individuals (from initial treatment entry to the time of interview, abbreviated as IT-INTVW hereafter).

This procedure summarizes the behavioral changes which occur contiguously with variation in treatment status compared to a fairly

stable pre-treatment baseline, and minimizes the specific influences of particular stages or time periods. The design also provides a repeated measures statistical test to determine whether the intervention has produced a significant change in the measured behaviors. The specific example to be discussed is the effect of methadone maintenance (MM) on heroin addict behaviors.

The data base utilized in this analysis is from extensive retrospective longitudinal interviews with 720 heroin addicts who had entered MM in Southern California. Figure 1 illustrates a typical addiction career history and possible treatment periods. The addiction career starts with the first narcotics use. Following an experimentational period, an addict may start problematic or daily use. The problematic use may stop, due to treatment or incarceration, but may start again. This cycle of abstinence and relapse is a common phenomenon among the chronic addicts. Because we are interested in evaluating the treatment effects so that subjects were selected from the treatment programs, all the subjects must have at least one treatment episode. The initial treatment entry usually follows some time after the first daily use and may continue or intermit several times by the time of the interview.

A diversity of outcome measures, reflecting several behavioral domains are included: (a) criminal related - drug dealing, property crime, and legal supervision. (b) drug related - daily narcotic drug use, daily marijuana use, daily nonnarcotic drug use, and heavy alcohol use. (c) social relations - marriage or common-law relationships, spouse narcotics use, and spouse on MM. (d) employment and welfare. Each of these variables was measured as the mean percent time in the

following specified status: (1) from first addiction or first daily use to first treatment entry, or FDU-IT period (2) in treatment during IT-INTVW, or ON period and (3) not in treatment during IT-INTVW, or OFF period.

Because several important demographic variables could affect treatment response, the study replicates the repeated measures assessment described above for both genders, Whites and Chicanos and the amount of time actually spent in treatment. This last variable refers to the proportion of time a subject has been in treatment during the follow-up period and classify Ss into four groups (1) extremely low treatment participation - less than 33%, (2) moderate participation - 34-66%, (3) considerable participation - 67-90%, and (4) full participation - 91-100%. The variable will provide information on whether the amount of treatment received makes a difference in the amount or consistency of behavioral changes, especially when Ss are not in the treatment.

This repeated measures design promises a better methodology in the evaluation of treatment effects and a better understanding of how the treatment affects men and women of two ethnic groups.

Method

Sample

The subjects for the present study were obtained by combining two separate groups of subjects who were followed in two distinct research projects (Anglin, McGlothlin, Speckart & Ryan, 1983; McGlothlin & Anglin, 1981). The first group consisted of 187 men and women methadone maintenance clients selected from rosters of clients active on June 30,

1976 at the Bakersfield and Tulare, California clinics (McGlothlin & Anglin, 1981). A second group of subjects consisted of 623 men and women clients who were active on September 30, 1978 at the San Diego, Riverside, San Bernardino and Orange County MM clinics (Anglin et al., 1983). From these two studies, 720 subjects were located and interviewed. Combining completion rates for both samples yielded an overall follow-up rate of 90% of those alive at the time of interview. The samples thus represent methadone clients from six different California counties interviewed between the inclusive years 1978 to 1981. The average follow-up periods after initial treatment entry range from 4 to 6 years. Since there were so few Black clients (less than 5% of each sample) and since Black clients constitute a small percent of California methadone patients, they were excluded from the present study to avoid the possible misinterpretation that the data could be representative of Blacks. The sample thus represents Anglo and Chicano men and women clients only.

The depth and comprehensiveness of the interview, in conjunction with the large sample sizes, lengthy follow-up periods and high completion rates enabled the obtained data to achieve a sufficient degree of representativeness to support the present investigation. The final sample (total N = 720) included in the analysis consisted of 251 Anglo men, 283 Anglo women, 141 Chicanos, and 45 Chicanas.

Interview Procedure

The interview was adapted in part from a schedule developed by Nurco and colleagues (1975), and has been described in detail earlier (McGlothlin et al., 1977). Briefly, a schematic time chart is prepared prior to the interview showing all official records of arrests and

intervals of incarceration, legal status, and treatment. The interviewer establishes the date of first narcotic use on the time chart, then proceeds chronologically to the point where narcotic use changes from less than daily use to daily use (or vice versa), or the respondent's legal supervision or treatment status change. Data are then collected on narcotics, alcohol and other drug use, employment, drug dealing, criminal behavior, and certain other variables for that interval. This process is repeated in a chronological sequence until the interview date. Thus, each interval is uniform in terms of narcotic use, legal status, and drug treatment enrollment.

This method of segmenting the interview into intervals which are meaningful to the respondent has proven quite successful in collecting retrospective longitudinal data covering long periods of time. Typically, the respondents appear to have little difficulty recalling for the specific period, whether they were employed, how frequently they were using narcotics, their costs, and how they were obtaining funds for drug purchase. The procedure requires the interviewer to work closely with the respondent to structure the period of concern, using the corroborative information and memory aids (e.g., life events and associated dates from previously collected records).

Results

The means for the background characteristics and for each of the multiple outcome measures are presented in Table 1 and are classified by sex and race and treatment retention. To more clearly demonstrate the behavioral changes over time periods characterized by the treatment status (pre, on, and off treatment) across different group

classifications, these major findings are illustrated in Figures 2 to 19.

Statistical tests using a repeated measures analysis of variance were conducted for each outcome measure separately to examine its time trend. The between-subject variables included treatment retention, sex, and race and the within-subject, or repeated factor, is time. To achieve sufficient representation for both "on" and "off" periods, repeated measures analyses are meaningful only for treatment groups 2 and 3, i.e., those subjects who had substantial times under both conditions. Thus, the treatment retention variable has only 2 levels corresponding to the treatment groups 2 and 3.

The time trend factor was significant for every outcome measure that was considered. The treatment participation factor does not show a significant effect except for alcohol use and dealing involvement, while sex and race show important differences in many outcome measures. Interaction between retention, sex and race have been found significant in several outcome measures, but basically the time trend is consistent across different treatment retention, sex and race. Because the time factor of treatment effect is the focus here, and was always significant at $p < .05$, we do not present any actual figures for the statistics.

Discussion

The repeated measures design presented in this study has proven to be an objective and informative method for treatment evaluation. The separation of periods characterized by treatment status (i.e., pre-treatment, on and off during the follow-up period) allows both the concurrent and sustained effects of treatment to be evaluated. This

method is especially desirable for repeated intervention episodes which also minimizes age-related or other biases often observed in the evaluation research. The repeated outcome measures taken in forms of mean % time engaging in the activities during the designated time period also avoids problems of unequal lengths of actual follow-up time among individuals. Comparisons either between or within subjects are thus more meaningful.

The application of this methodology has been illustrated by an evaluation of methadone maintenance treatment for chronic heroin addicts. Regardless of race and sex or the amount of treatment participation, significant reduction in criminal and drug- related activities (i.g., daily narcotics use, drug dealing activities, and property crime involvement), and significant increases in pro-social activities (i.g., employment, marriage) have been observed while addicts are in treatment. During periods when addicts are discharged from treatment, some sustained improvement is still observable, although to a lesser degree when compared to the concurrent treatment effects. Other measures such as marijuana use or nonnarcotics drug use, however, did not vary much across treatment status, and alcohol use demonstrated an opposite time trend, actually increasing during treatment.

There are significant sex and race differences for many of the outcome measures. Some of these differences may interact with treatment status. This suggests that evaluation research should also take into account the heterogeneity of the treatment population and the fit between clients characteristics and the treatment characteristics for designing a more effective treatment intervention.

References

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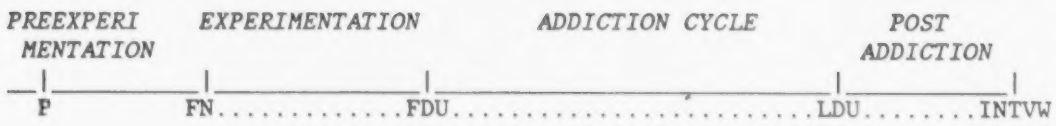
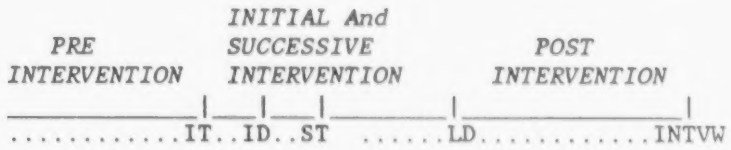
FIGURE 1

Addiction Career and Treatment Periods

Addiction Career



Intervention Cycle



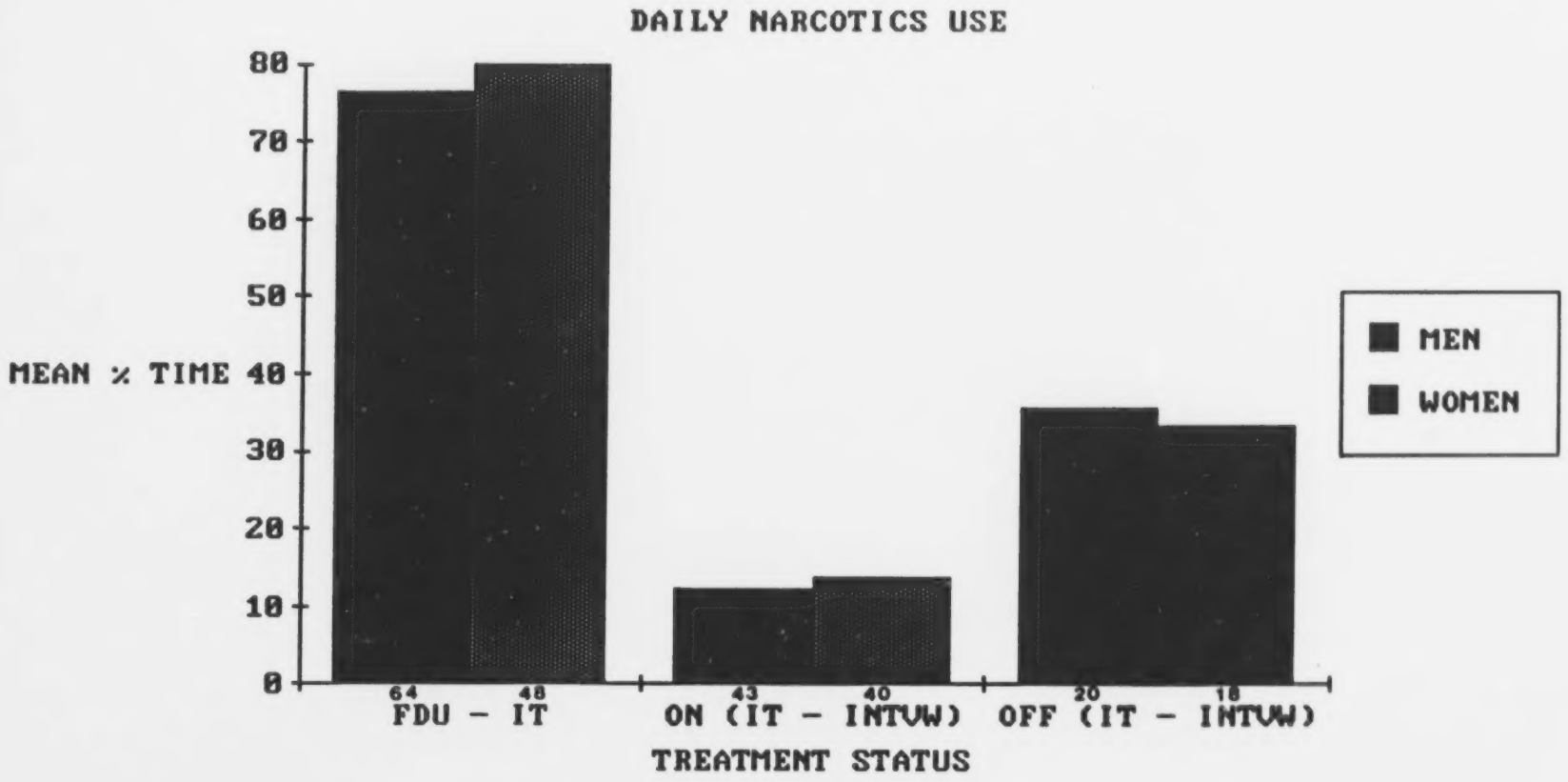
Abbreviations for the Addiction Career

P - one year prior to first narcotics use
FN - first narcotics use (Initiation)
FDU - first daily narcotics use (30 days or longer)
LDU - last daily narcotics use
INTVW - date of interview

Abbreviations for Treatment

IT - initial treatment intervention strategy (drug treatment, CJS custody, etc.)
ID - first discharge or release from initial intervention program
ST - successive treatment (one or more occasions)
LD - last discharge from treatment

Note: ..... indicates that the designated critical dates could vary along the indicated periods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MEAN % TIME
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70
60
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40
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0
64
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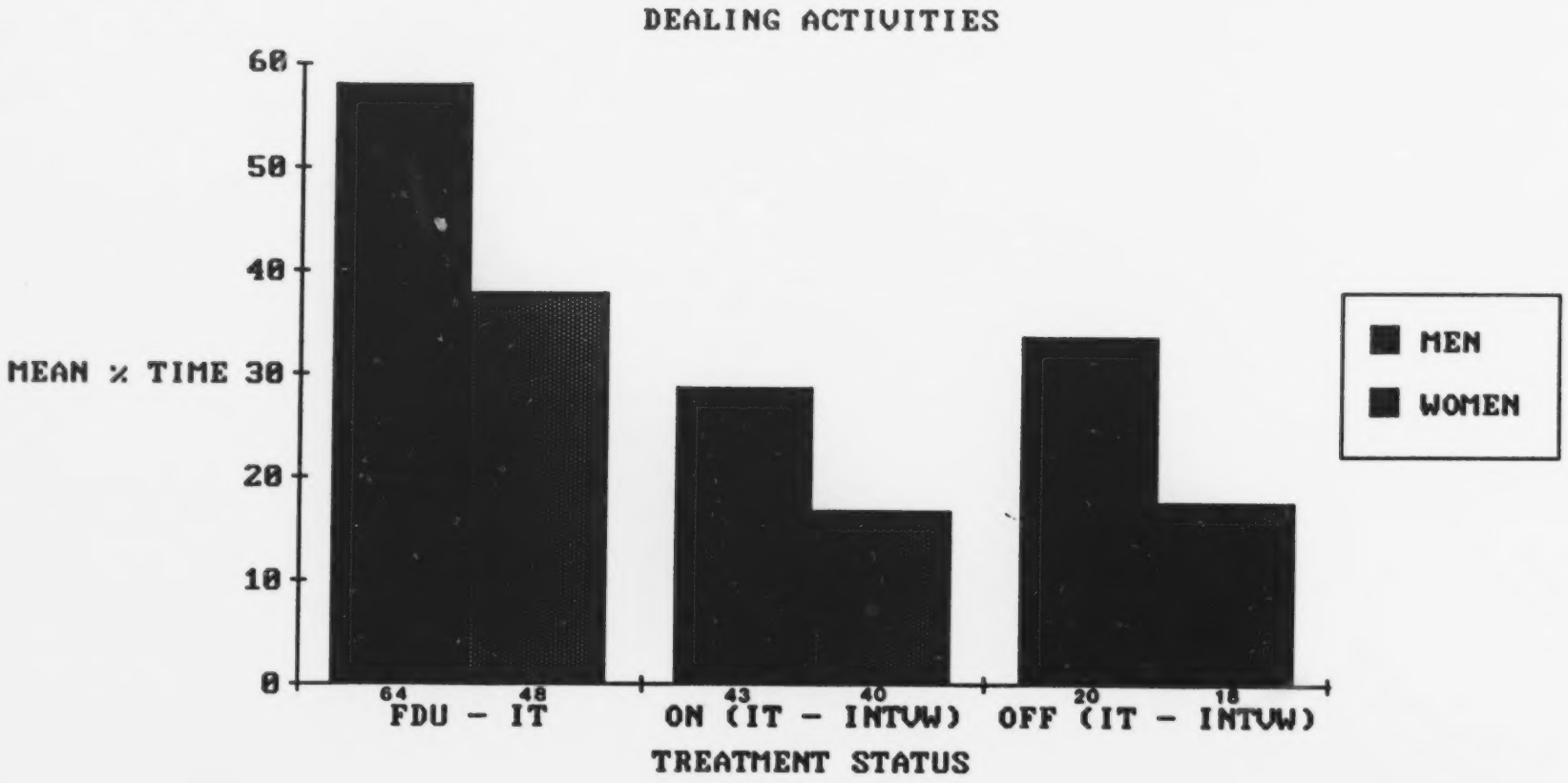
FDU - IT
ON (IT - INTVW)
OFF (IT - INTVW)
TREATMENT STATUS
MEN
WOMEN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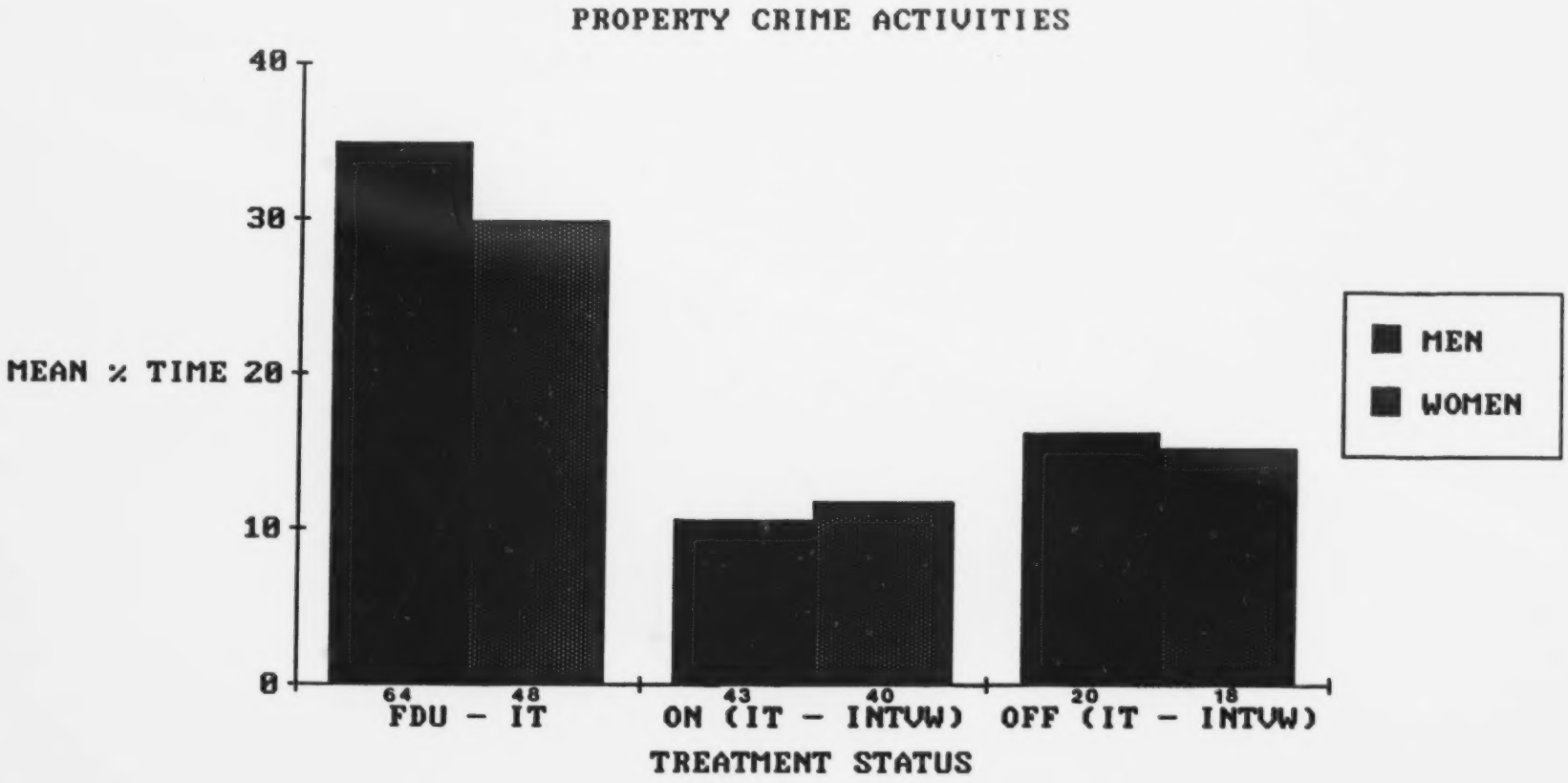
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MEAN % TIME
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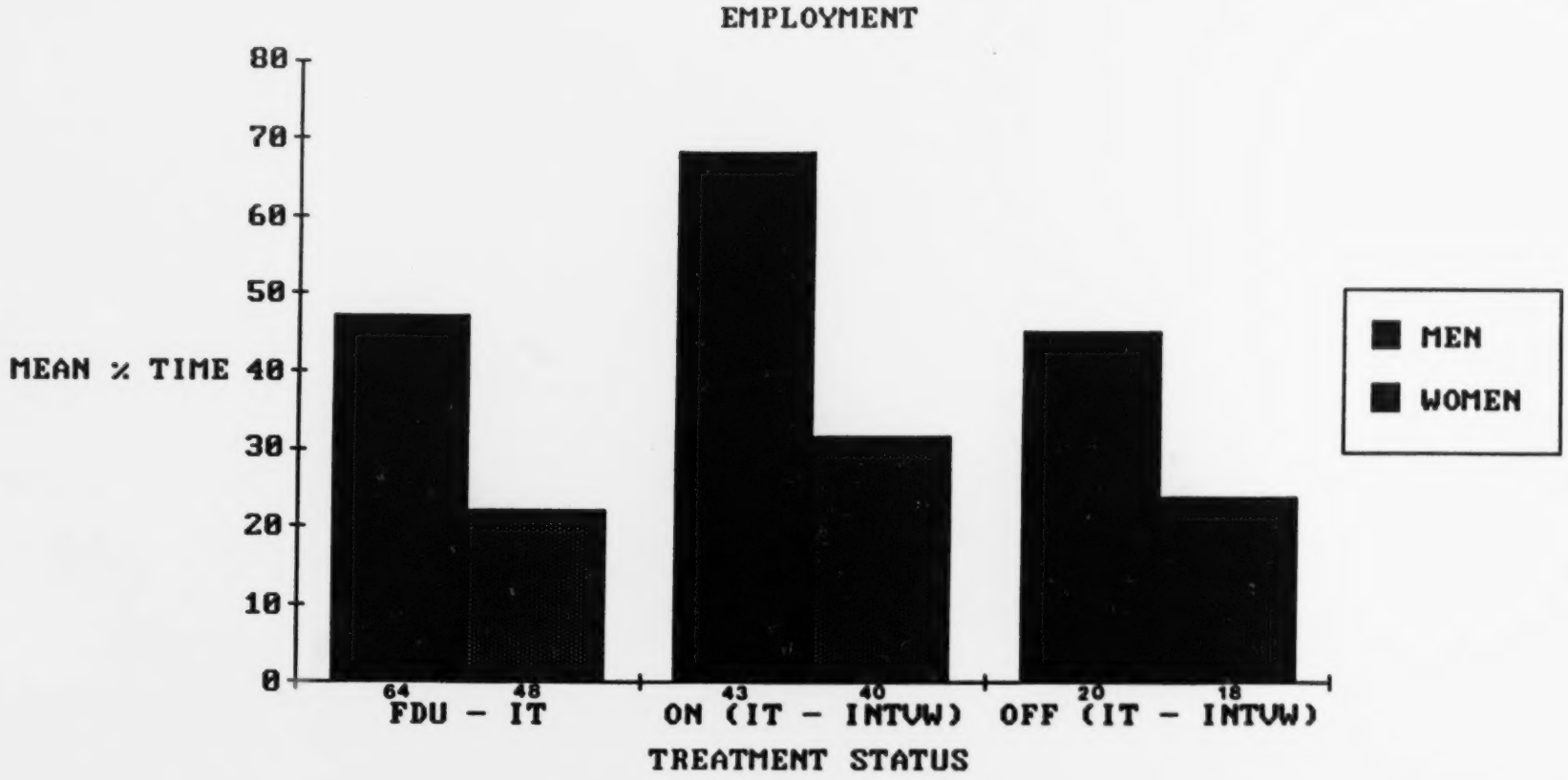
TREATMENT STATUS
MEN
WOMEN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TREATMENT STATUS
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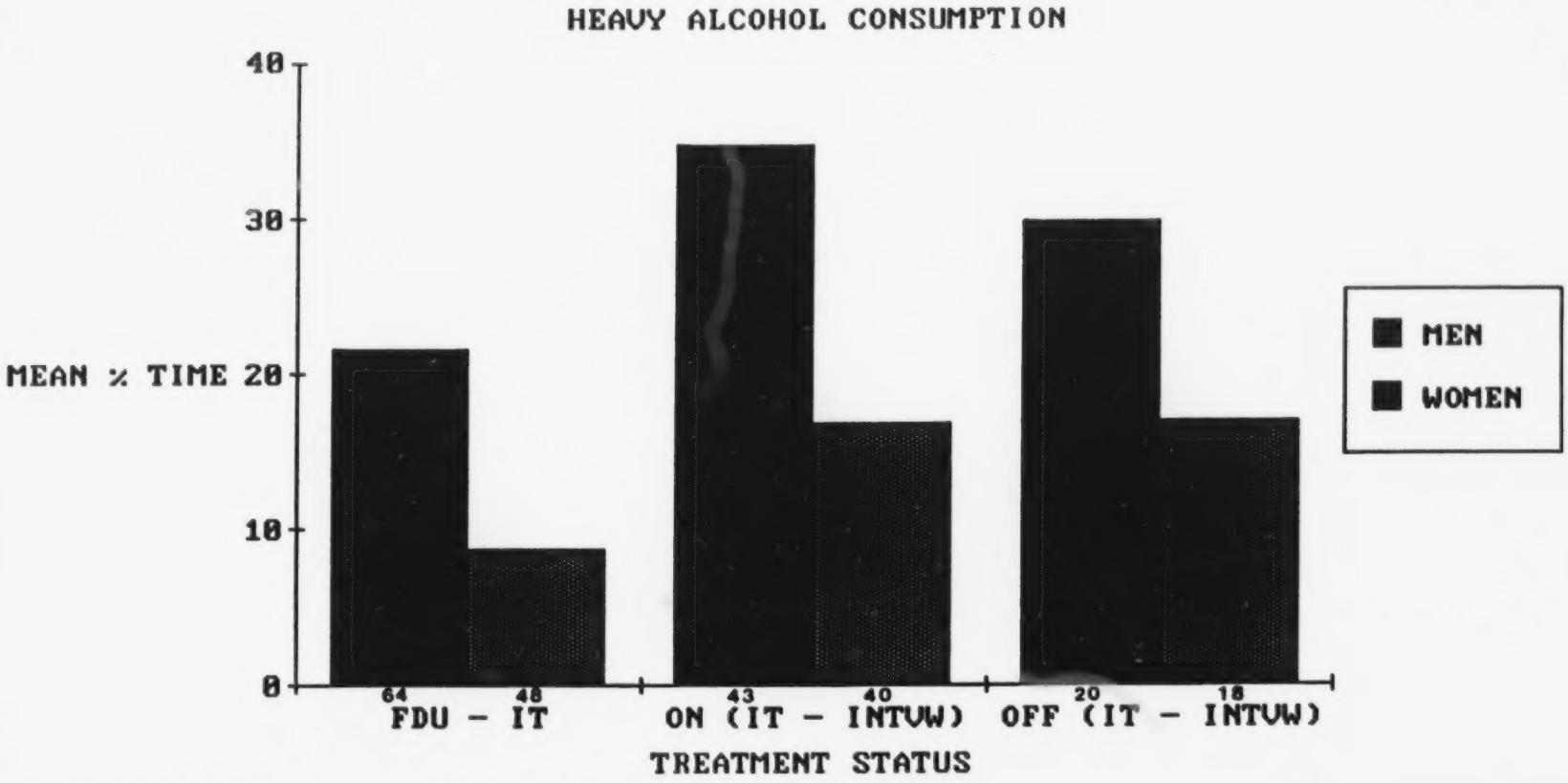
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TREATMENT STATUS
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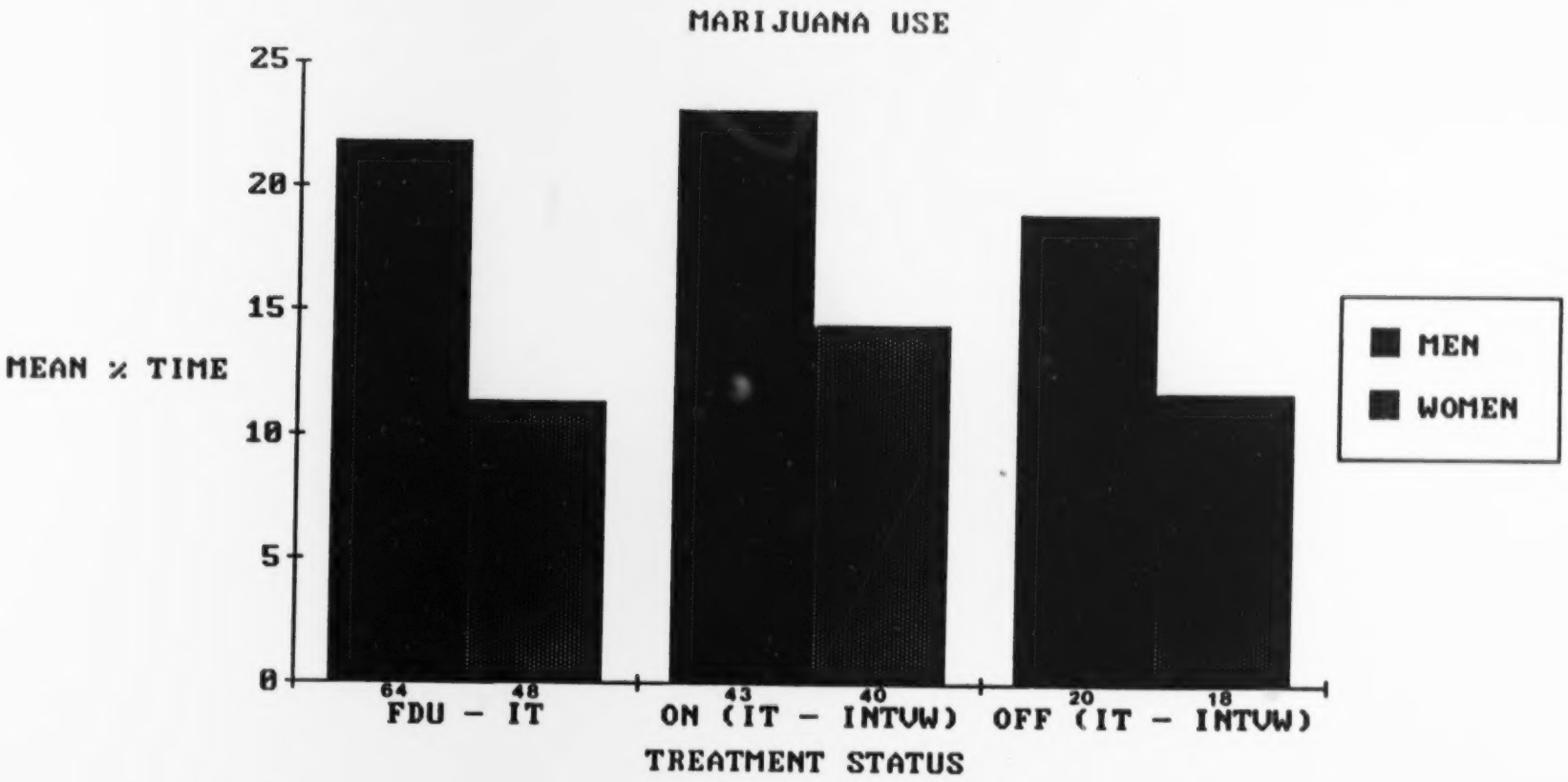
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MEAN % TIME
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TREATMENT STATUS
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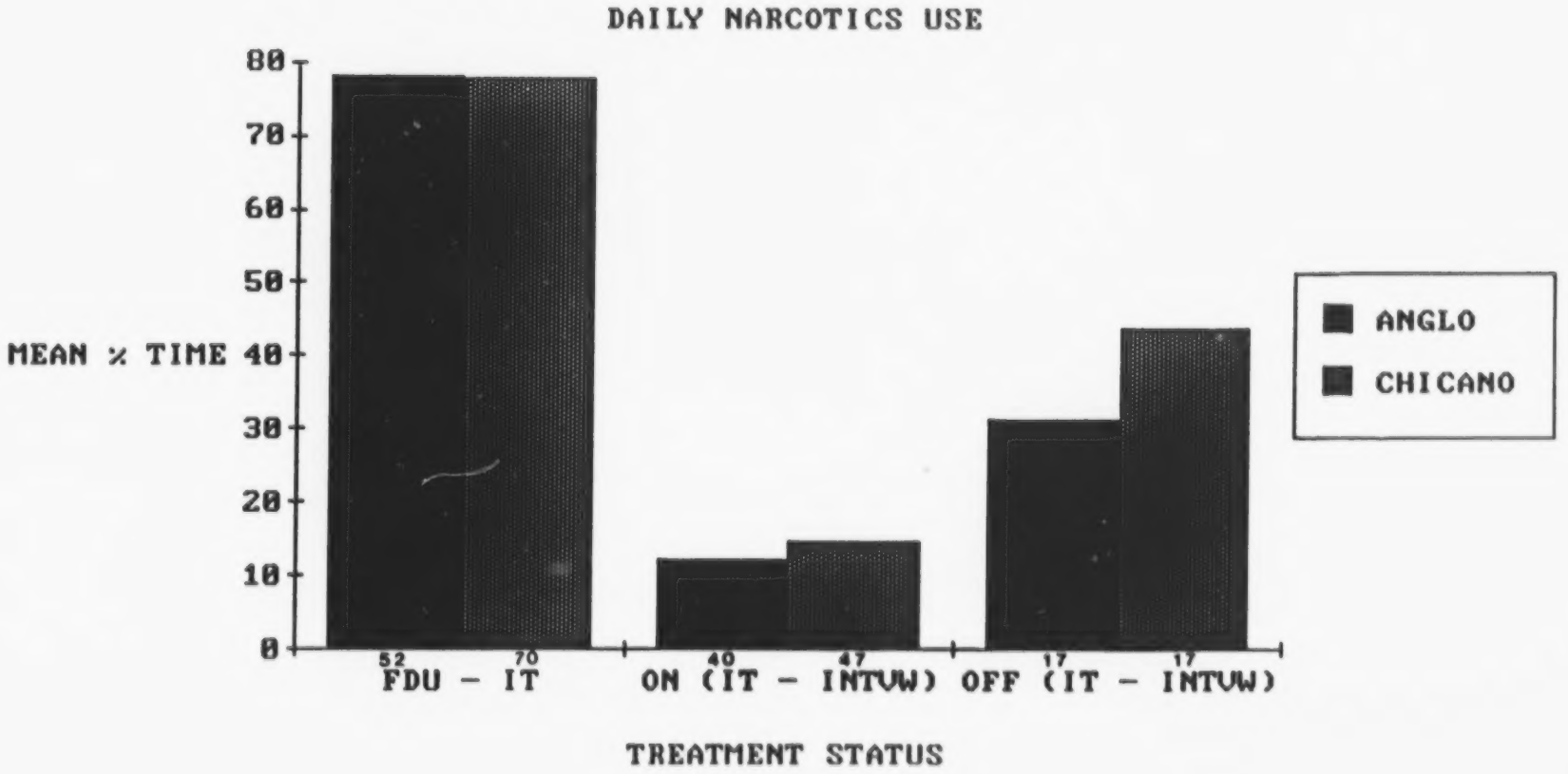
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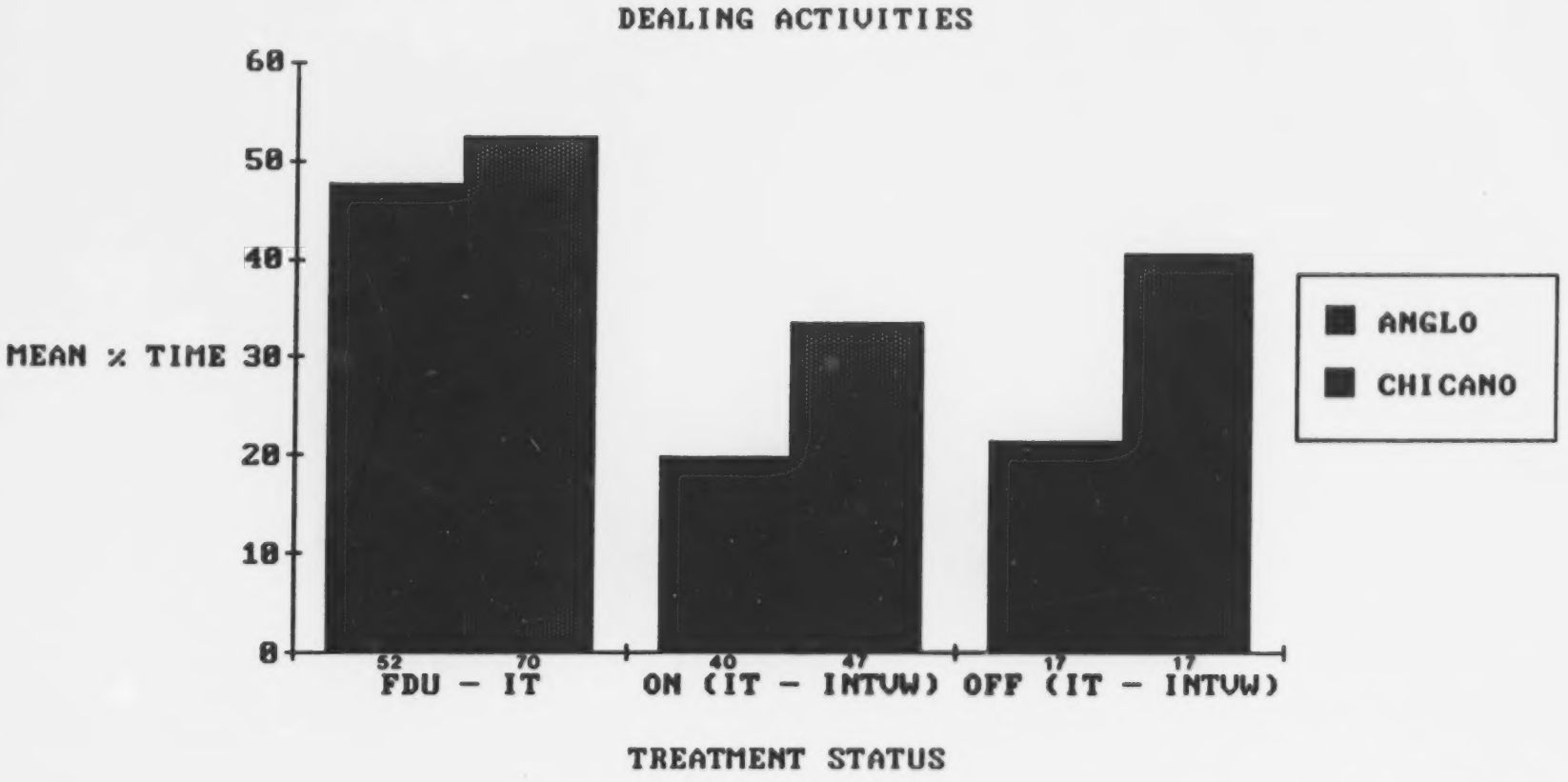
TREATMENT STATUS
ANGLO
CHICANO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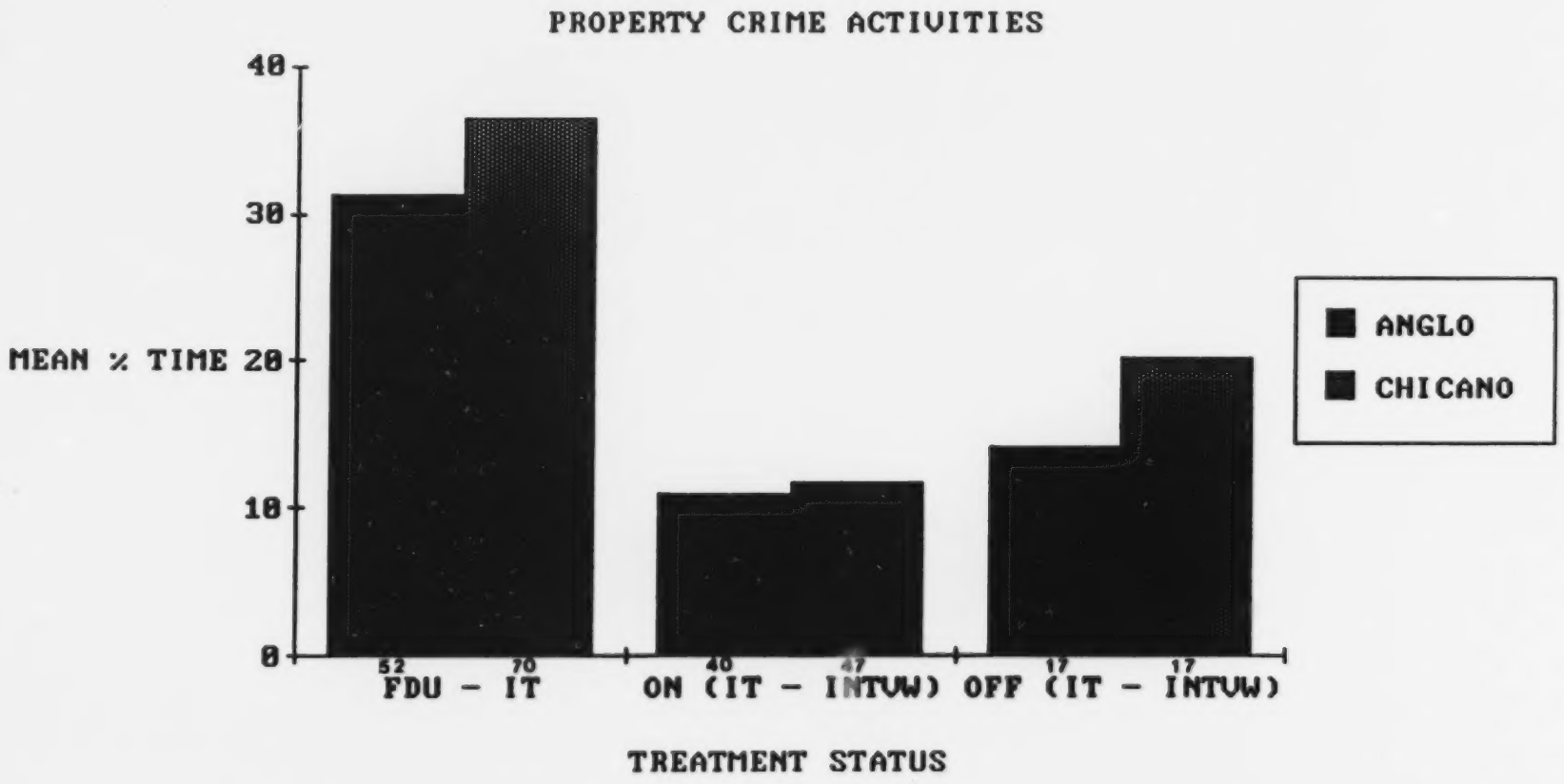
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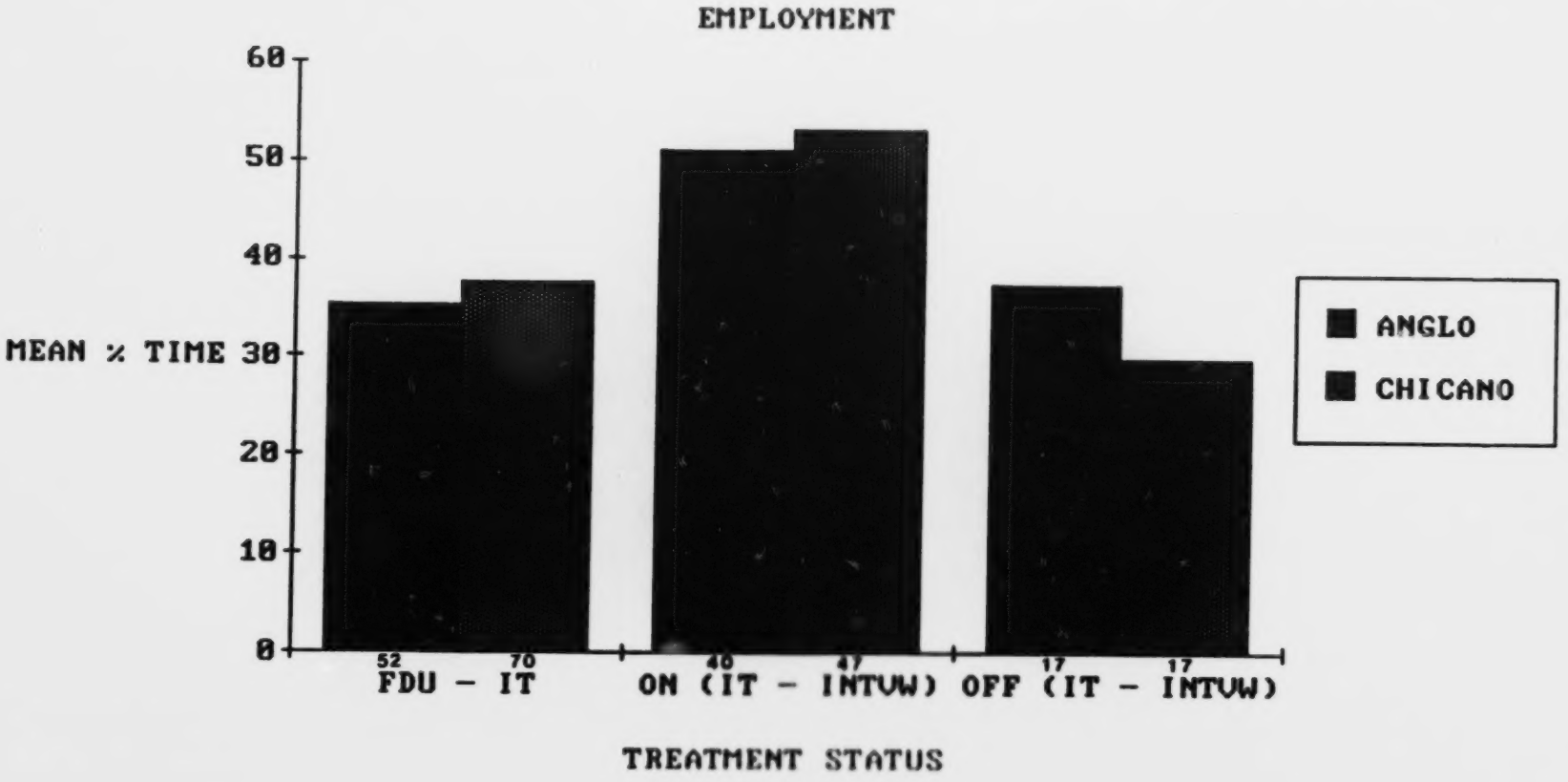
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TREATMENT STATUS
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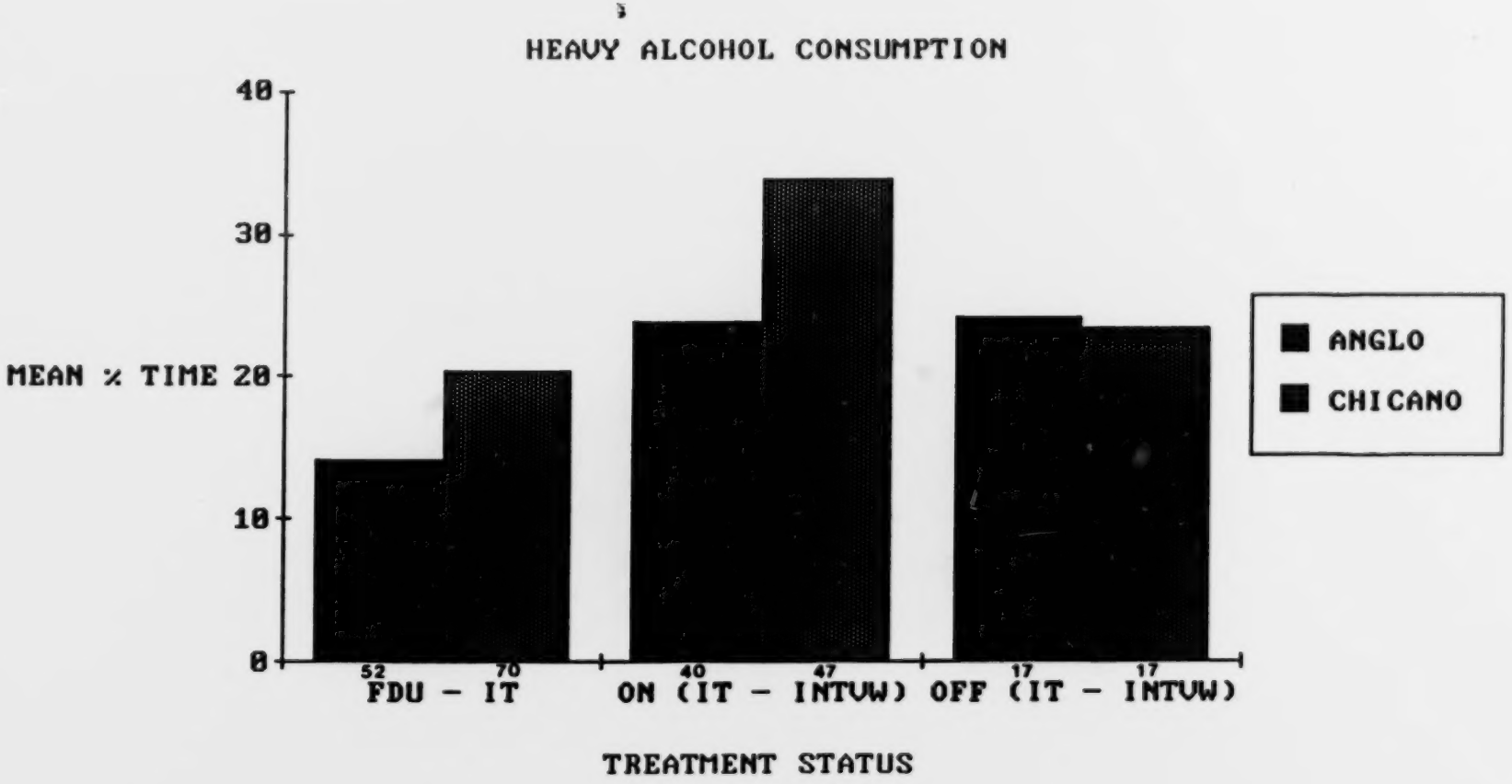
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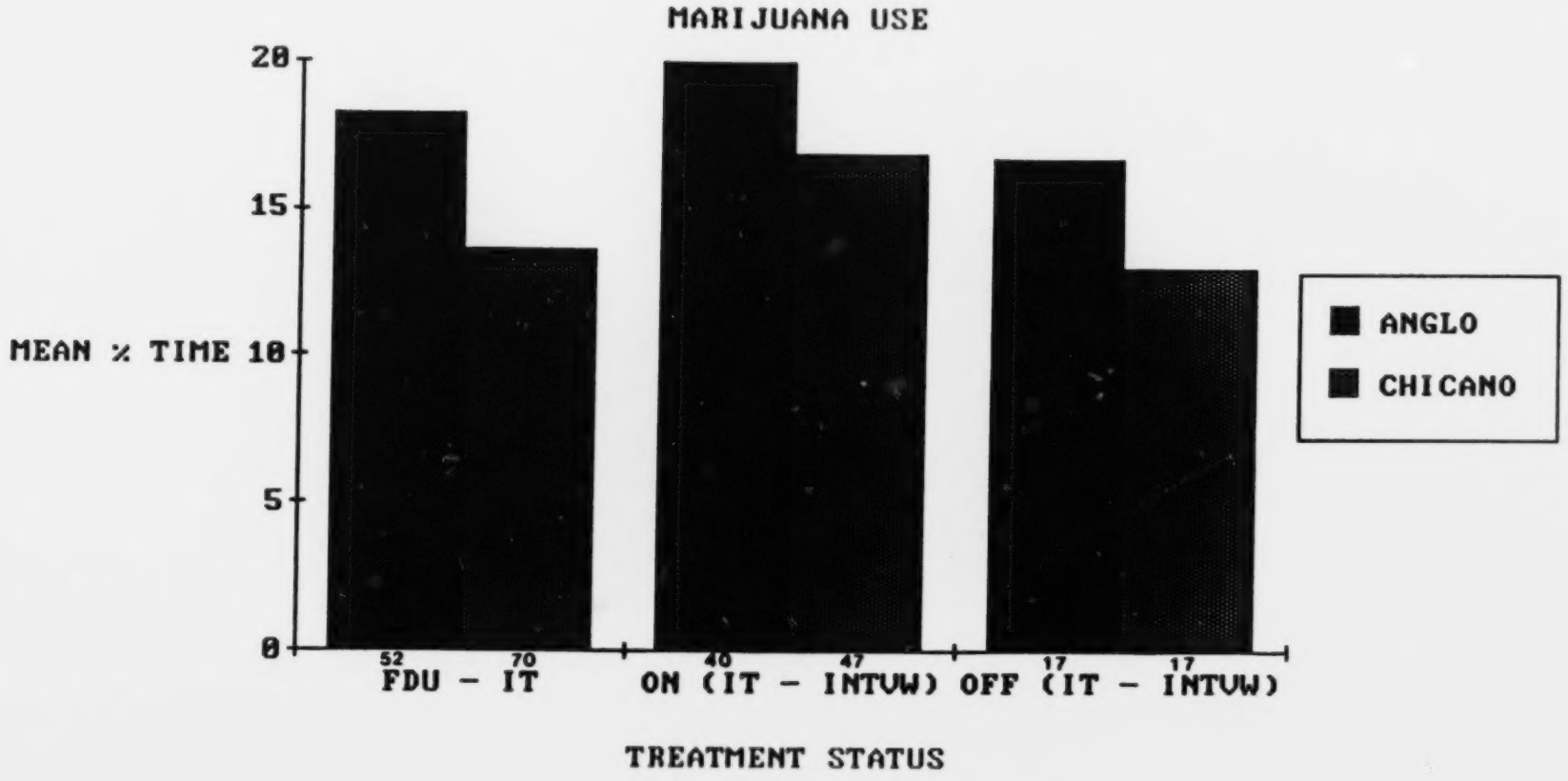
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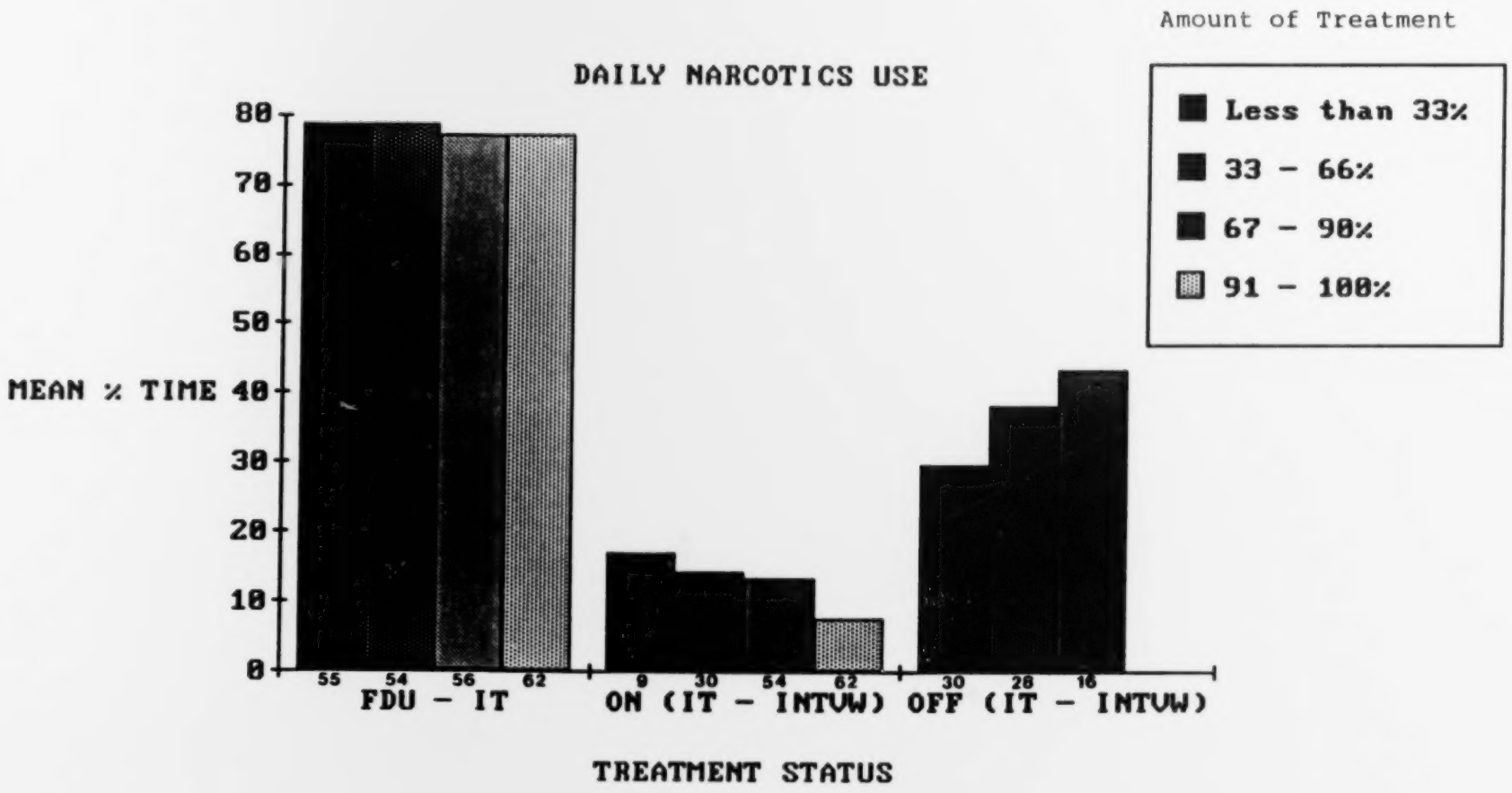
DAILY NARCOTICS USE
Amount of Treatment
Less than 33%
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67 - 90%
91 - 100%
MEAN % TIME
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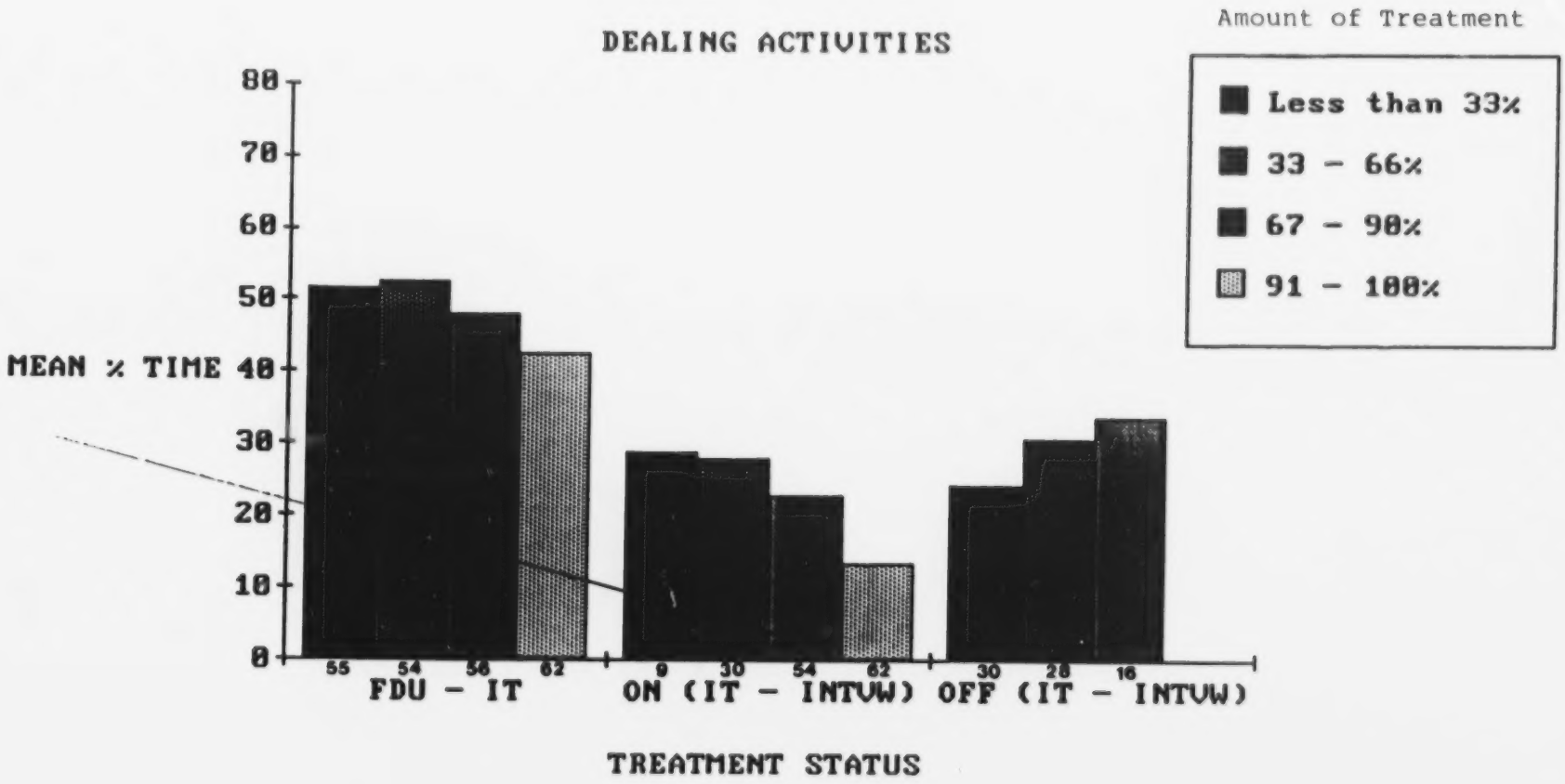
DEALING ACTIVITIES
Amount of Treatment
Less than 33%
33 - 66%
67 - 90%
91 - 100%
MEAN % TIME
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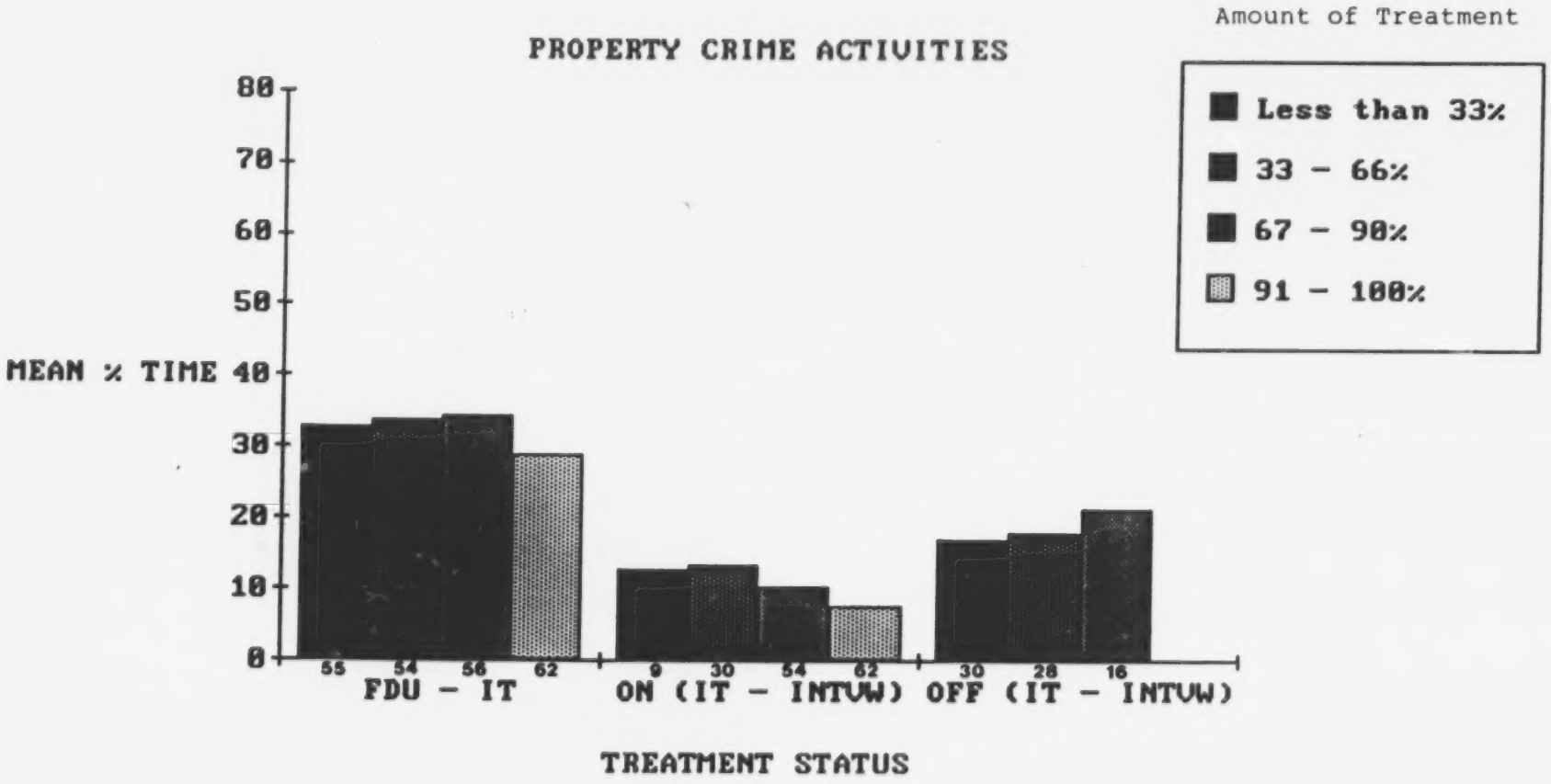
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Amount of Treatment
Less than 33%
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TREATMENT STATUS

EMPLOYMENT
Amount of Treatment
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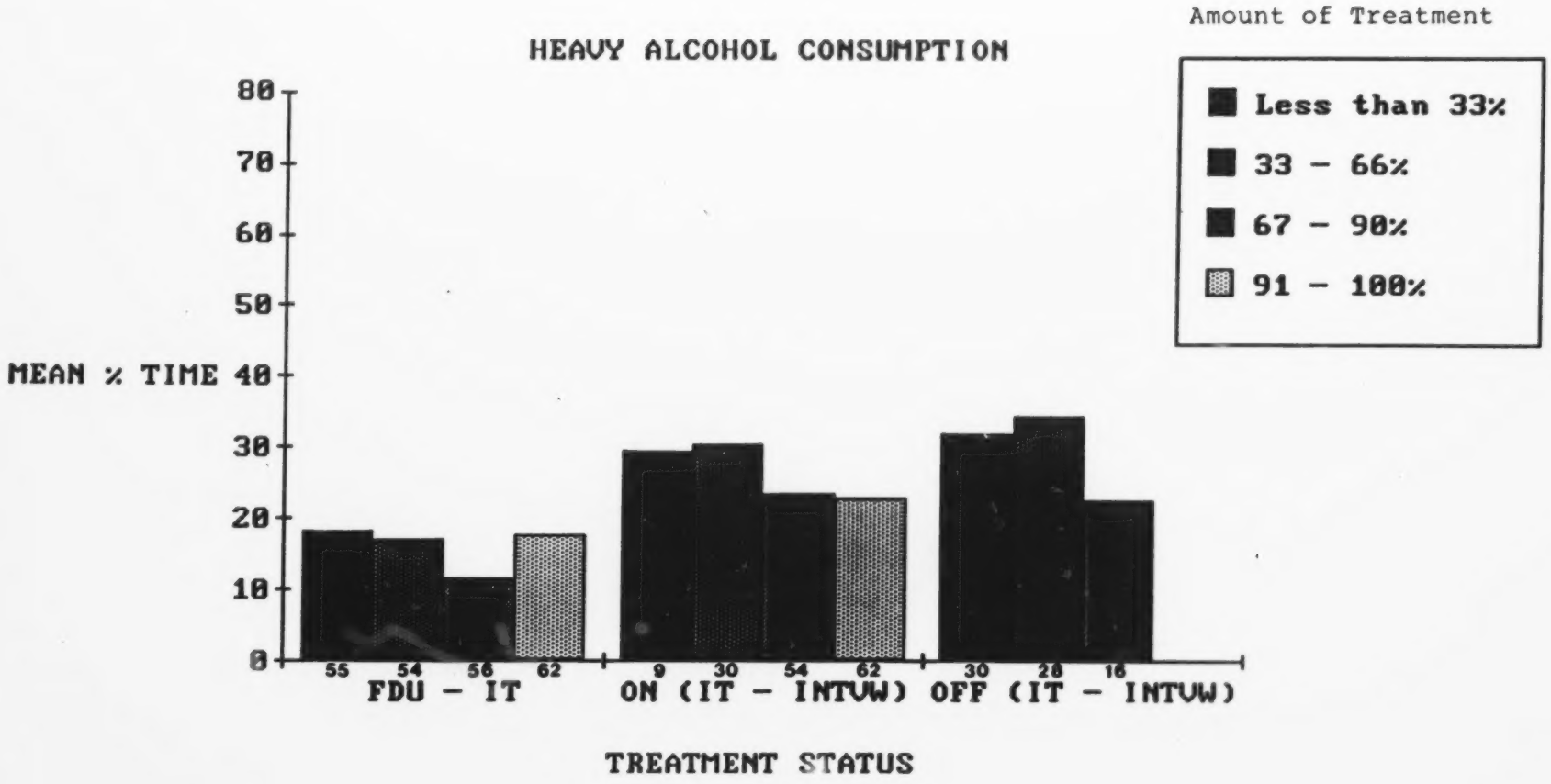
HEAVY ALCOHOL CONSUMPTION
Amount of Treatment
Less than 33%
33 - 66%
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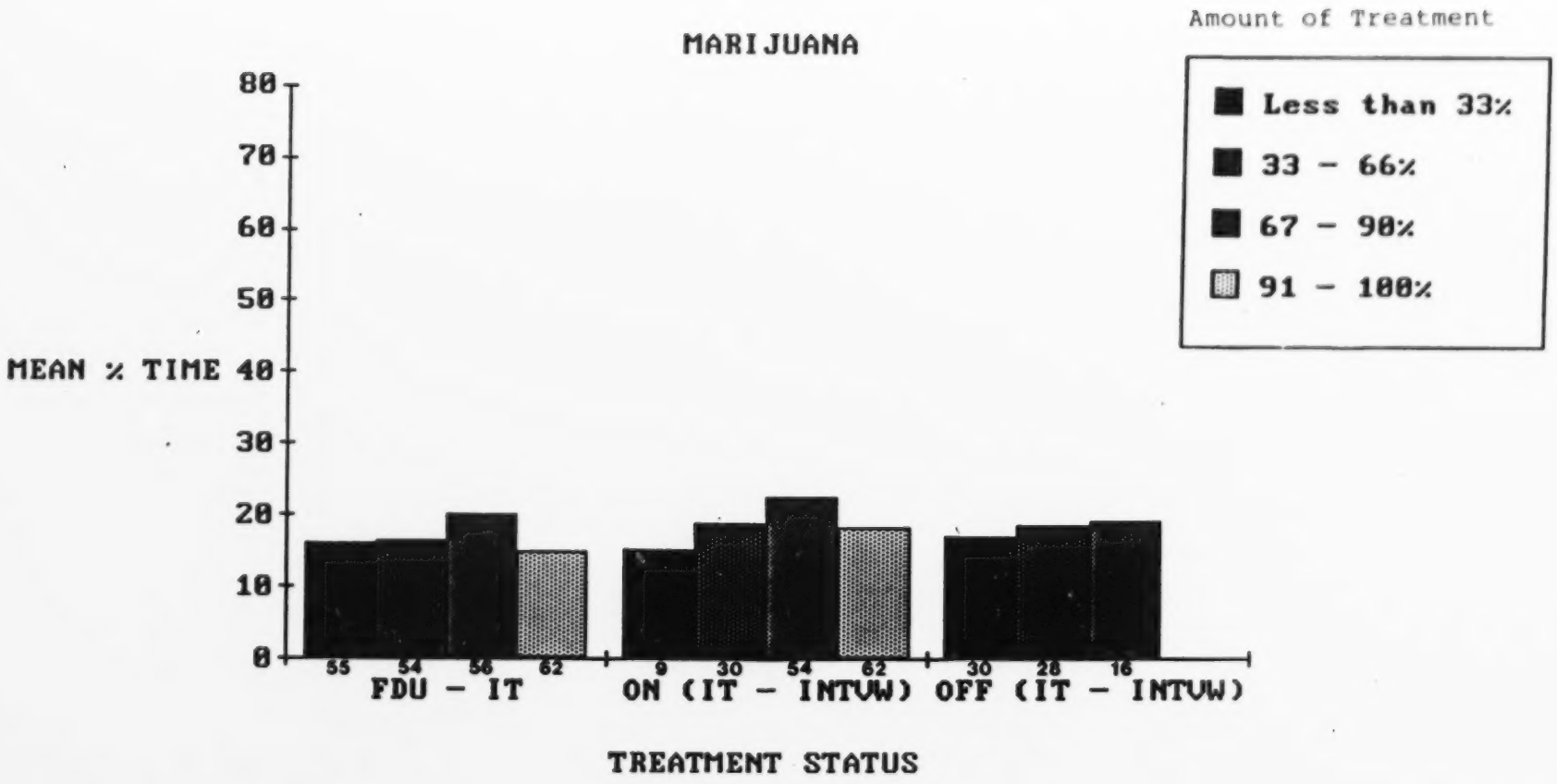
MARIJUANA
Amount of Treatment
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MEAN % TIME
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TREATMENT STATUS

Table 1 Means by Sex, Race, and Treatment group

	Treatment Group 1 (less than 33%)				Treatment Group 2 (34-66%)				Treatment Group 3 (67-90%)				Treatment Group 4 (90-100%)				
	Chicano		White		Chicano		White		Chicano		White		Chicano		White		
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	Total
N	11	8	31	48	47	17	83	102	46	13	81	69	37	7	56	64	720
BACKGROUND																	
Age at FN	19.6	18.6	19.9	19.1	19.3	20.0	19.2	19.1	19.1	21.3	19.8	19.5	19.6	22.6	19.1	20.2	19.5
Age at FDU	22.7	19.8	21.3	20.2	21.5	21.0	20.5	20.1	20.5	22.5	21.0	20.6	21.5	22.8	20.6	20.8	20.8
Age at IT	30.2	23.4	26.7	24.8	29.8	26.9	26.6	23.9	30.5	27.6	26.3	24.7	30.8	29.0	26.9	25.8	26.6
Age at interview	34.1	27.6	30.0	28.2	35.5	32.7	31.7	28.9	37.5	33.2	32.2	30.6	36.6	35.7	32.0	31.2	31.9
SES	2.0	2.0	2.5	2.9	2.1	2.4	2.8	3.0	1.9	1.9	3.0	3.0	2.0	1.6	3.0	3.0	2.7
Education	8.9	10.0	11.2	11.4	9.7	10.3	11.4	11.3	9.1	10.3	11.3	11.4	9.6	9.0	11.6	10.9	10.9
Problem in school	5.1	6.2	4.4	3.8	5.3	5.3	4.0	3.7	5.0	4.9	4.4	2.7	4.3	5.9	3.5	3.2	4.0
Problem in family	3.4	3.5	3.0	3.0	2.4	3.0	2.9	3.3	2.5	2.8	2.5	3.0	2.1	3.2	2.7	2.9	2.8
Age at first arrest	16.1	14.7	17.8	18.7	15.6	16.1	16.6	17.8	15.4	18.4	17.2	19.2	17.2	23.3	16.6	18.8	17.4

Table 1 continued

	Treatment Group 1 (less than 33%)				Treatment Group 2 (34-66%)				Treatment Group 3 (67-90%)				Treatment Group 4 (91-100%)				
	Chicano		White		Chicano		White		Chicano		White		Chicano		White		
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	Total
N	11	8	31	48	47	17	83	102	46	13	81	89	37	7	56	64	720
PRV - IT																	
Months in period	77.2	37.6	56.5	51.5	69.2	48.3	60.5	43.0	78.5	56.8	51.4	46.1	81.6	64.6	58.3	53.9	56.6
Mean % time																	
Daily use	75.3	91.1	78.9	77.0	77.5	74.7	74.0	84.0	80.1	70.7	77.7	76.2	73.8	95.8	75.0	79.4	78.0
Marijuana	21.1	12.9	19.6	13.1	16.3	10.1	26.1	9.5	21.2	7.7	24.1	16.8	5.2	0.0	29.9	9.2	17.0
Nonnarcotics	7.5	11.8	1.0	12.0	4.8	7.1	7.1	10.0	2.0	3.0	7.0	8.2	3.2	0.7	5.6	8.1	6.9
Alcohol	23.2	15.9	19.8	16.3	26.5	10.1	24.8	7.7	19.4	6.1	14.0	4.8	26.7	6.7	23.0	8.8	15.8
Married	93.1	33.4	51.0	63.7	69.3	58.1	43.1	45.8	85.9	72.1	40.1	48.1	64.1	45.8	42.0	67.5	53.2
Spouse drug	9.1	39.5	15.2	29.2	10.8	35.5	14.7	46.7	3.5	42.3	17.5	42.1	0.5	48.8	15.5	39.1	25.2
Spouse mm	1.9	3.3	0.0	1.5	0.0	3.6	0.2	1.5	0.0	1.2	0.0	6.9	0.0	0.0	0.0	3.6	1.5
Employ	40.9	3.8	43.6	29.9	36.2	16.7	47.7	21.3	46.7	14.4	44.6	22.3	57.0	9.6	56.7	24.8	35.9
Welfare	2.1	59.9	3.5	20.1	9.1	33.3	4.9	25.8	4.8	33.2	4.7	32.0	6.0	44.5	6.9	22.6	15.6
Dealing	71.1	61.7	61.3	39.6	62.5	41.7	59.5	44.0	56.2	22.9	61.7	31.1	47.4	30.3	51.3	33.6	48.8
Property crime	54.3	59.6	24.7	29.0	36.5	32.7	35.8	30.7	39.3	19.4	36.1	31.9	27.2	54.7	34.5	21.9	32.8
Incarceration	23.0	7.9	11.8	3.4	19.3	23.2	11.6	3.3	19.8	10.8	14.0	4.6	17.0	3.3	15.7	5.8	10.9
Legal supervision	42.7	34.6	23.5	19.5	33.4	43.2	34.4	16.4	40.5	30.9	31.6	21.4	32.0	13.1	36.6	21.9	28.2
On (IT - INTVW)																	
Months in period	9.4	11.5	7.7	9.1	33.4	32.5	29.0	29.1	59.8	52.3	51.0	55.2	64.3	77.6	57.7	63.0	41.6
Mean % time																	
Daily use	24.2	17.0	17.6	14.8	19.8	8.1	9.7	16.2	14.4	17.3	12.7	12.9	6.1	18.7	5.5	5.0	12.8
Marijuana	18.2	12.5	20.1	11.1	17.5	23.5	26.5	12.2	26.1	10.5	24.2	20.0	7.8	0.0	31.8	14.7	19.2
Nonnarcotics	9.1	1.4	0.0	7.0	0.7	4.3	2.4	6.0	0.9	0.0	3.9	4.7	0.3	3.9	6.1	3.5	3.7
Alcohol	23.6	18.7	40.0	25.7	50.9	17.7	40.3	15.2	36.6	12.0	24.1	15.8	35.9	6.0	25.0	15.2	26.5
Married	87.7	78.0	70.9	59.3	88.8	43.0	60.0	58.8	90.9	79.8	66.4	70.0	75.7	64.5	63.2	73.4	68.6
Spouse drug	9.1	21.7	8.2	13.3	10.6	10.1	5.1	14.6	5.7	16.9	6.8	15.7	2.6	19.9	3.6	39.1	9.6
Spouse mm	16.4	44.9	26.3	24.5	15.6	18.5	22.0	40.5	14.9	64.1	27.0	41.1	7.2	53.5	24.7	42.2	28.9
Employ	49.2	8.3	66.2	37.2	54.6	20.3	67.3	31.8	71.3	24.4	73.5	34.1	73.0	8.8	74.3	34.1	51.6
Welfare	18.2	63.1	2.5	34.0	12.0	38.8	10.2	38.3	9.7	44.7	10.1	46.0	10.8	71.1	8.8	32.6	23.5
Dealing	55.8	37.5	34.5	17.5	52.7	34.9	24.9	17.9	32.1	4.3	22.7	20.5	15.4	17.1	21.3	5.0	23.3
Property crime	7.1	27.3	8.1	14.6	12.5	13.1	16.4	11.6	10.0	10.5	9.3	11.6	7.2	28.4	7.1	6.0	11.1
Legal supervision	19.1	58.1	36.7	31.6	45.0	33.4	39.8	28.3	47.6	16.6	33.5	27.0	27.8	10.0	34.5	21.6	32.8
Off (IT - INTVW)																	
Months in period	33.0	31.7	29.2	30.0	27.4	32.0	25.8	28.9	17.0	12.9	15.7	15.2					18.6
Mean % time																	
Daily use	33.5	52.4	21.6	30.3	54.9	45.1	34.5	32.9	54.6	47.7	39.9	39.9		(Not Applicable*)			40.6
Marijuana	26.6	0.0	19.6	16.0	14.9	10.6	29.3	12.6	22.9	14.5	21.3	15.3					18.5
Nonnarcotics	11.2	4.5	1.8	6.5	3.4	7.5	3.5	6.6	2.5	1.1	0.0	5.8					5.3
Alcohol	39.8	31.4	47.4	20.1	42.4	19.2	45.5	24.2	27.7	6.6	24.8	19.6					28.2
Married	76.6	58.4	60.0	57.5	72.6	57.8	55.4	53.2	71.3	50.8	65.1	60.8					59.8
Spouse drug	7.8	29.2	7.6	10.2	8.6	19.5	8.7	19.1	8.6	26.3	12.2	18.6					13.6
Spouse mm	0.0	0.0	2.5	0.5	5.0	11.7	2.2	3.0	1.4	11.1	5.7	5.8					4.2
Employ	42.2	13.6	67.6	31.9	44.2	20.6	59.2	31.8	41.7	9.0	55.8	30.1					42.5
Welfare	18.3	61.7	8.7	30.2	16.8	35.9	9.7	29.7	13.9	60.6	14.4	50.1					24.3
Dealing	53.9	37.0	27.4	13.6	59.9	28.8	29.0	18.6	54.7	18.4	32.8	23.6					31.0
Property crime	19.5	59.9	13.8	11.4	24.0	13.5	21.8	12.7	20.6	25.8	17.1	25.9					18.5
Legal supervision	27.4	44.4	49.6	37.8	39.7	40.3	38.8	30.8	36.5	25.7	32.5	24.1					34.5

* Sixty-five percent (or 104 subjects) of this treatment category (N=164) have been in treatment during the entire follow-up period, and thus do not have this off-period. The average number of months off treatment for this group is only 1.4 months. Therefore, measures in this period for this category are not applicable.

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